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UTILIZATION OF RHENIUM IN CONTEMPORARY TECHNOLOGY

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Cand Econ Sci

The position of rhenium in the periodic system below manganese, on the one hand, and between wolfram and osmium, on the other hand, indicated the method of searching for it in natural compounds. Rhenium was first discovered in Russian platinum ore (0.0001 percent). Later it was found in Norwegian molybdenites and other minerals.

Interest in its practical uses developed as soon as the first quantities of rhenium were obtained. First of all, it was used in electrical technology. Electric bulb filaments made of it proved more durable than those made of wolfram. A coating of rhenium on wolfram filaments in vacuum tubes reduced the radiation of electrons and the dispersion of wolfram. The next use of rhenium was in measuring instruments, especially in alloys with platinum in the manufacture of thermocouples for measuring temperatures up to 2,000 degrees centigrade. Rhenium is also utilized as a catalyst in various chemical processes.

The presence of rhenium in mineral rocks is being studied more thoroughly, at present than the many more abundant elements. Contemporary geochemical minds are turning towards isolated districts which have extraordinary accumulations of rhenium. A. Ye. Fersman believes that a concentration of rhenium is possible, in the metallic core of the earth and also in its sulfide envelope. There is a drop in the rhenium content of plutonic magma silicate and in old crystallized minerals, rich in iron and magnesium. Rhenium does not occur in chromites, magnetites, or olivines. It accumulates in residual granite fusions; it is frequently present in molybdenites and the rare-earth mineral, gadolinite, and, in particular, in compounds of a number of other rare-earth elements such as erbium and ytterbium oxides.

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For contemporary study, the most interesting rhenium bearers are high-temperature sulfide ores. But even in the same vein, the ratio of rhenium and molybdenum is seldom constant. In general, the rhenium content in molybdenites from deposits in different countries varies greatly--from 1.8 to 21.8 grams per ton of ore. The hypothesis that diffused rhenium passes into oceans in the form of a readily soluble ion and, perhaps, is also absorbed by soil deposits should be mentioned.

At present, therefore, it may be assumed that high-temperature sulfides--particularly cuprous molybdenum ores, including those lacking a commercially valuable molybdenum content--are sources of raw rhenium material. To these may be added titanium, rare-earth, and platinum ores. Soviet research workers have correctly demonstrated that rhenium extraction must be carried on simultaneously with the extraction of a number of other valuable and rare elements.

In spite of the fact that there are plants in foreign countries engaged in the extraction of rhenium, there are no exactly defined raw rhenium material specifications. The experience of industrial enterprises which obtain rhenium from complex ores and tailings in nonferrous metallurgy is, of course, insufficient to work out such conditions. Consequently, the problem of the technical possibilities and economic expediency of the commercial utilization of rhenium-bearing raw material must be solved in each concrete case on the basis of corresponding technological investigations.

The molybdenum glance, from which the first grams of rhenium were obtained under laboratory conditions, contained only 0.0002 percent rhenium. The tailings in the Mansfeld Factory in Thuringia, in which industrial production of rhenium first started, contained 0.0005 percent of this metal. During its whole period of industrial production of rhenium, Germany obtained only about 300-400 kilograms

In the USSR, geochemical and chemicotechnological work in extracting rhenium from native raw material was begun long before the World War II. The vast mineralogic material collected from various deposits in the Soviet Union has been studied for a number of years. These studies have established the high rhenium content in ore concentrates produced in large quantities by some of the concentration plants. Thus, during the years of the Stalin Five-Year Plan, a reliable basis has been created for the industrial extraction of rhenium.

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